Formulated Biomass Fuel Using Poultry Litter

Poultry Litter & Renewable Resource Seminar

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Problems

- Excess phosphates due to land application of litter and wastewater sludges
- FDA to ban poultry litter as a feed for ruminant animals due to BSE (mad cow disease)
- Might the FDA prohibit poultry litter from being applied to grazing land?
- Wastewater sludges from poultry processing can also carry BSE infectivity
- Dead poultry carcasses may also be considered BSE contaminated

The Challenge

Implement a solution that:

1. Solves all the issues, including food safety
2. Is technically feasible
3. Is economically sustainable
4. Is politically acceptable
5. Offers the best social benefits

Background

"Combustion of animal biomass is one way to use livestock and poultry manure while reducing water and air quality problems and lessening the transmission of certain disease organisms. Using animal biomass as a fuel can eliminate its use in products that might be hazardous to human health, and can also reduce the need for conventional fuels. Co-firing with animal biomass helps reduce greenhouse gas and SO_2 emissions . . . "

Proceedings of the
Animal Waste Utilization Workshop
June 8 & 9, 1999
Sponsored by the US DOE

Background

- **Biomass** is defined as all kinds of organic matter available on a renewable basis for conversion to energy which includes: crops, agricultural residues, animal wastes, organic portion of municipal solid waste and methane from landfills.

- Aug 1999, EO 13134; "Developing and Promoting Bio-based Products & Bio-energy" was initiated
  - DOE created five regional programs for the promotion of biomass as an alternative fuel
  - EO 13134 will guide Federal efforts to accelerate the development of 21st century bio-based industries that use trees, crops agriculture, forest and aquatic resources to make an array of commercial products including fuels, electricity, chemicals, adhesives, lubricants and building materials.

Background (con't)

- Annual livestock production in 1997
  - Turkeys: 292 million birds
  - Laying hens: 297 million birds
  - Dairy and beef cattle: 101 million head
  - Hogs and pigs: 56 million head
  - Chickens for meat: 7 billion birds
- These livestock generate 1.4 billion tons of manure per year
- Broiler operations produce 1.1 to 1.4 tons of litter per 1,000 birds per year
- In certain areas, pressure on livestock producers is increasing because minimal land is available for manure utilization.

Background (con't)

Major obstacles to the development of bio-energy and bio-products:

1. Economics which must value social, environmental and food security issues
2. Stakeholder awareness of bio-energy technologies and feed stocks.
3. Absence of a concerted, coordinated strategy among federal agencies, state utility commissions, and environmental regulators

Background (con't)

- Energy value of dry dissolved air floatation (DAF) sludge =12,000 BTU/lb
- Energy value of dry poultry litter = 4,500 BTU/lb
- Poultry litter contains nitrogen, sulfur, chlorine and ash
- Moisture content is variable and must be controlled for proper combustion
- Biomass fuels burn best when dried to 15% to 20% moisture

Energy generation

Currently available direct combustion technologies using manures as fuel can be used to produce:

1. Space heat
2. Process heat
3. Hot water or steam
4. Electricity

Co-firing Animal Biomass

- Co-firing fossil fuels with animal biomass will reduce greenhouse gas, SO_2, and NO_x emissions
- Products of biomass combustion include: Carbon dioxide, carbon monoxide, hydrocarbons, NO_x, SO_2, and inorganic ash
- Direct combustion technologies available:
  - Spreader stoker
  - Fluidized bed
  - Rotary kiln
  - Stationary hearth incinerator
  - Co-fired with coal combustor

Co-firing (con't)

- Techniques to co-fire biomass in utility (electricity generating) boilers
  - Blend biomass with coal in the utility's coal yard (problematic)
  - Biomass prepared separately from the coal and injected into the combustor along with coal (more desirable)

The Solution

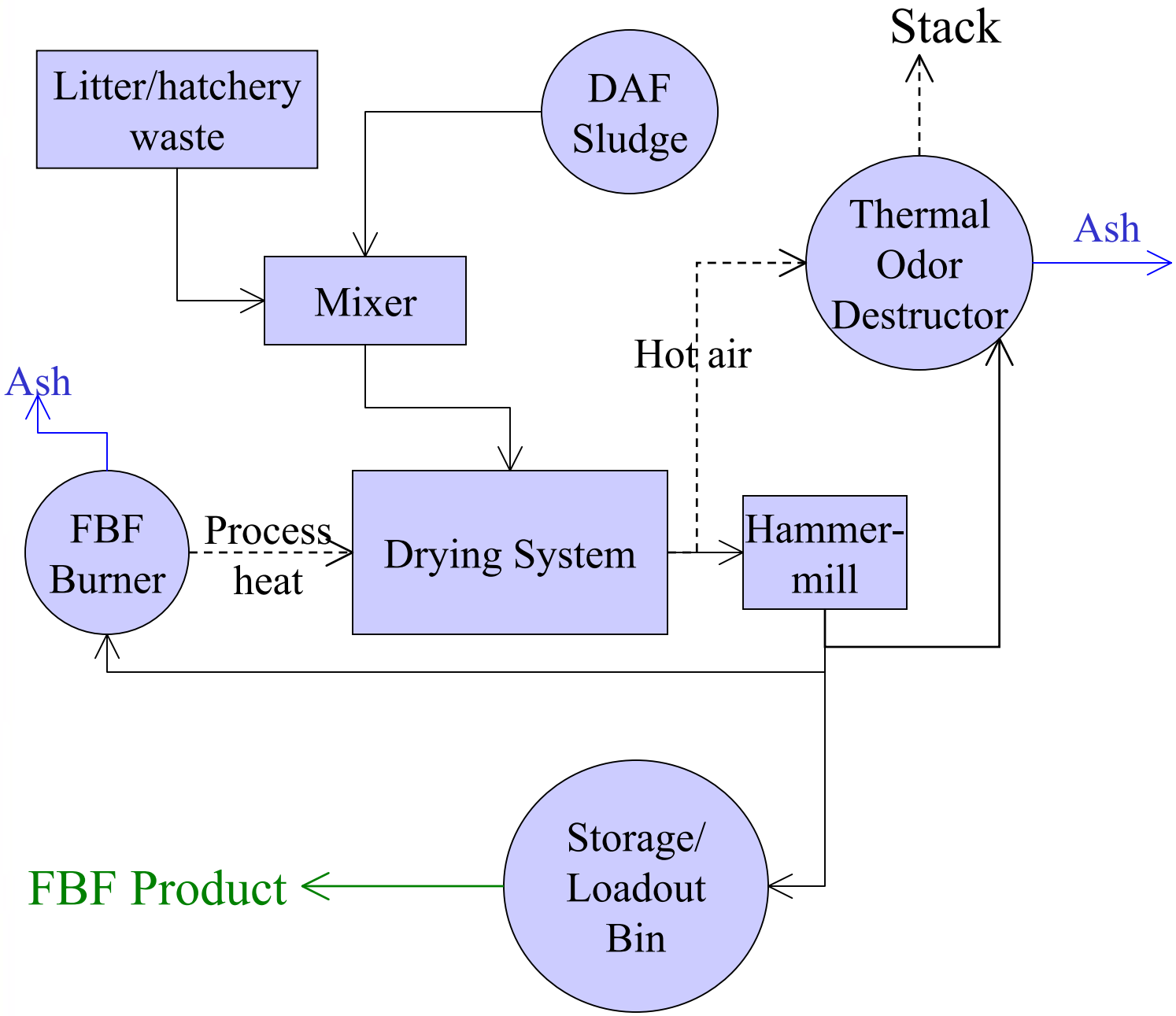
The Solution is . . .

- Take poultry litter and wastewater sludges and create a formulated biomass fuel (FBF)
- Sell FBF to:
  - existing coal-fired electric producers to co-fire with coal
  - cement manufacturers for co-fire in kilns
  - rendering plants for steam production and fueling hot-air dryers

Technical Feasibility

- Use of existing, proven technology
- Initial fuel analysis proves potential
- Successful pilot scale test run
- Could be up and running in one year

FBF Plant Schematic



Making FBF

2 cups of litter

1 cup of waste-water sludge

Ready for Drying

Mix for 2 minutes or until consistent

Formulated Biomass Fuel

Fresh from the oven

Products and by-products

- Product – Fuel sold to coal-fired power plants
- By-products
  - Odor: storage silos for litter and thermal destruction for exhaust gas
  - Ash: Sold as cement additive
- Phosphorus
  - Present in the power boiler ash and sold as a cement additive

Co-Firing (con't)

Why co-fire in existing utility boiler?

- The equipment and infrastructure already exists (lowest capital cost)
- The only user that can take all the quantities required
- Reduced greenhouse gas emissions
- Low cost approach for the utility to generate "green power"
- The product's market (electricity) already exists

Co-firing is the most promising technology for utilizing animal bio-mass as energy

Economic Sustainability

150,000 tons per year FBF plant

- No additional costs to growers
- Several coal-fired utility boilers in the area
- Projected capital required - $16M
  - Need government backing to prove economics
  - Construction complete 10-12 months after funding

Public Policy

- Need a coalition among government agencies (EPA, USDA, DOE, FDA, states)
- Environmental Impact Statement should include “offsets” from reduced land-applied wastes
- States’ DEQ should waive re-permitting of coal-fired plants co-firing FBF below 15%
- Will require government backing up to 100% for the first plant
- FBF should be approved as a growers’ Environmentally Qualified Nutrient Management plan

Conclusions

- Food safety regulations may eliminate any land application of poultry biomass
- Combustion is the best control for BSE infectivity
- There is an emerging market for burning poultry litter to provide electricity
- Economics will require a formulated fuel
- Fuel plants can be built, owned and operated by stakeholders
- Stakeholders will lower their energy costs by using FBF

The best application to solve environmental, economic, and safety issues for everyone

Summary

1. A solution without additional regulations
2. Addresses ALL the problems
   - Land applied phosphorus
   - Food Security
   - Renewable energy and “green power”
3. The most cost effective solution
4. Promotes sustainable poultry operations
5. Proven readily available technology

Questions?